



Hey diddle, diddle, the cat and the fiddle;

The *sheep* jumped over the moon?

NASA isn't planning to launch sheep into space, but the agency has rounded up a herd of sheep as part of a study to "mimic the impact of space travel on bones to better understand bone health and healing." The three year project, which is costing taxpayers \$1.2 million, is being conducted at Colorado State University (the school's mascot coincidentally is a sheep)."

The sheep aren't floating around inside an anti-gravity chamber or on the International Space Station. Instead, the back leg of each sheep was put in a brace that kept it from bearing weight, simulating the effects of microgravity. iii

During Phase 1 of the study, 23 sheep were put in the microgravity brace for eight weeks and monitored by orthopedic surgeons to "provide pain relief when necessary." iv v

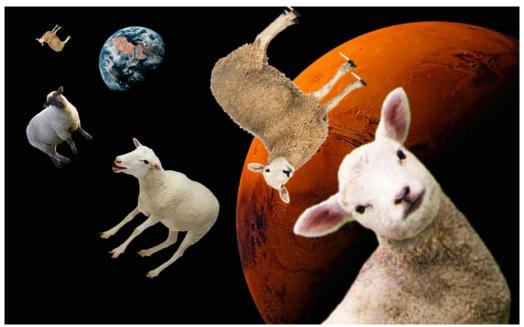
"Because the bone was isolated from any gravitational forces, the research team was able to discern that the sheep's bone density decreased—as did the load required to fracture the bone. The weakened bone could break more easily," the researchers reported. vi

The second phase of the study "focused on bone regeneration in the absence of gravity." The microgravity-simulating brace was attached to 20 sheep for three weeks. Then veterinary orthopedic surgeons removed part of bone in the sheep's leg that had been suspended. The brace was then reaffixed to the sheep's leg to observe how the bones healed in simulated microgravity over four weeks.

"We found that it definitely does slow down the healing," said Ross Palmer, one of the researchers involved in the study. Palmer says "although this project is a niche application for NASA, there's also a massive potential benefit for the greater population."

THE FARCE AWAKENS

The researchers also hope to use the sheep to "develop treadmill protocols that enhance bone fracture healing in the presence of simulated microgravity."^x



NASA is spending \$1.2 million to study the impact of microgravity on sheep.

NASA, which "has long known astronauts lose bone density in space,"xi has already been conducting human studies on these same topics for years.

Astronauts on the International Space Station who worked out on an Advanced Resistive Exercise Device, for example, "returned to Earth with more lean muscle and less fat, and maintained their whole body and regional bone mineral density compared to when they launched." Several other studies evaluating "dietary effects on bone are being studied on the space station right now." Xiii

Back on Earth, NASA has been funding "pillownaut" studies for 50 years in which bedridden test subjects lie around for months at a time to examine the impact of microgravity on bones and the rest of the human body. XiV And an "anti-gravity" treadmill, derived from technology developed by NASA to prevent astronaut bone loss, has been used in physical therapy for years. XV

WASTEBOOK THE FARCE AWAKENS

¹ "Sheep Helping NASA Prepares for Trip to Mars," American Sheep Industry Association, February 21, 2014; https://www.sheepusa.org/NewsMedia WeeklyNewsletter 2014 February February212014 SheepHelpingNasaP reparesForTripToMars.

ⁱⁱ Kortny Rolston, "Bones In Space: Researchers study effects of microgravity on astronauts' bones on missions to Mars," Colorado State University Magazine, Fall 2014; http://magazine.colostate.edu/issues/fall-2014/bones-in-space/.

[&]quot;" "Sheep Helping NASA Prepares for Trip to Mars," American Sheep Industry Association, February 21, 2014; https://www.sheepusa.org/NewsMedia_WeeklyNewsletter_2014_February_February212014_SheepHelpingNasaPreparesForTripToMars.

iv "Discoveries: Space sheep," BizWest, February 21, 2014; http://bizwest.com/discoveries-space-sheep/.

[&]quot; "Discoveries: Space sheep," BizWest, February 21, 2014; http://bizwest.com/discoveries-space-sheep/.

vi "Sheep Helping NASA Prepares for Trip to Mars," American Sheep Industry Association, February 21, 2014; https://www.sheepusa.org/NewsMedia WeeklyNewsletter 2014 February February212014 SheepHelpingNasaP reparesForTripToMars.

vii "Discoveries: Space sheep," BizWest, February 21, 2014; http://bizwest.com/discoveries-space-sheep/?refresh=1.

[&]quot;Discoveries: Space sheep," BizWest, February 21, 2014; http://bizwest.com/discoveries-space-sheep/.

[&]quot;Discoveries: Space sheep," BizWest, February 21, 2014; http://bizwest.com/discoveries-space-sheep/.

 $^{^{}x} \ Contract information for NASA grant NNX11AQ81G, USAspending.gov, accessed October 20, 2015; \\ \underline{https://www.usaspending.gov/transparency/Pages/TransactionDetails.aspx?RecordID=0E408A43-45D0-4B33-87E7-2CE1DD32FE8E&AwardID=44196563&AwardType=C . \\ \end{aligned}$

xi Kortny Rolston, "Bones In Space: Researchers study effects of microgravity on astronauts' bones on missions to Mars," Colorado State University Magazine, Fall 2014; http://magazine.colostate.edu/issues/fall-2014/bones-in-space/.

xii "NASA Study Provides New Findings On Protecting Astronauts' Bones Through Diet And Exercise," NASA website, August 24, 2012; http://www.nasa.gov/home/hgnews/2012/aug/HQ 12-291 ISS Bone Density.html.

[&]quot;NASA Study Provides New Findings On Protecting Astronauts' Bones Through Diet And Exercise," NASA website, August 24, 2012; http://www.nasa.gov/home/hqnews/2012/aug/HQ_12-291_ISS_Bone_Density.html.

xiv Senator Tom A. Coburn, M.D., "Wastebook 2013," December 2013.

xv "'Anti-Gravity' Treadmills Speed Rehabilitation," Spin Off, NASA Publications and Graphics Department, 2009; http://spinoff.nasa.gov/Spinoff2009/pdf/spinoff2009.pdf.